Remarks

Claims 1-19 are pending, and claims 1-19 stand finally rejected. Claims 1-19 are cancelled without prejudice by this amendment. Claims 20-39 are added by this amendment and do not constitute new matter. Applicants respectfully traverse the rejection and request allowance of claims 20-39.

Regarding section 1 of the office action, the Applicants submitted formal drawings in response to the April 10, 2002 office action that incorporated the amendments. Therefore, new drawings do not have to be submitted.

Regarding sections 2-4 of the office action, the rejections by the Examiner are moot in light of the cancelled claims 1-19.

However, the Applicants wish to address the references cited by the Examiner in the final office action dated August 14, 2002; U.S. Patent 5,458,808 (Suggitt) and U.S. Patent 5,259,239 (Gaisford). The Applicants also wish to address some references submitted in an IDS filed along with this amendment; Japanese Patent Abstract publication number 10120401 (Japanese Abstract) and EP 1213566 (Haldor Topsoe). The Applicants will distinguish new claims 20-39 from these references.

Suggitt and Gaisford

Suggitt teaches a process for monitoring the hydrocarbon heat content of a feed-gas to keep the heat content at a desired level for a partial oxidation process that generates hydrogen (column 4, lines 52-64). The process uses a partial oxidation unit (18), a shift converter (20), and a hydrogen purification unit (26) (FIGS. 1 and 2) to generate a high purity hydrogen stream (28) (column 7, line 53 to column 8, line 25). To keep the system running efficiently for feed-gases having varying heat contents, an evaluating means (36), flow meters (38), heat content analyzers (32), and valves (42) are used to monitor and adjust the heat content of the feed-gas (see FIG. 1). The evaluating means knows a desired flow rate and a desired heat content for the partial oxidation unit (column 9, lines 46-49). The evaluating means receives a heat content of the feed gas and a flow rate of the feed-gas from the flow meter and heat content analyzer on the feed-gas line (FIG. 1; column 9, lines 61-67). The evaluating means also receives a heat content of the recycled gas stream (30)(the moderator) and a flow rate of the recycled gas stream from the flow meter and heat content analyzer on the recycle gas stream line (FIG. 1; column 9, lines

61-67). Based on the heat contents and the flow rates, the evaluating means adjusts the valves for the feed-gas and the recycled gas stream to maintain the desired heat content and the desired flow rate into the partial oxidation unit (column 11, line 30 to column 12, line 13).

Gaisford teaches a multiphase hydrocarbon mass meter. The multiphase hydrocarbon mass meter measures the mass of a hydrocarbon in a multiphase mixture of oil, water, and gas (column 2, lines 10-23). The multiphase hydrocarbon mass meter is able to instantaneously measure the mass flow of the oil and gas (hydrocarbons) (column 5, lines 44-56). To measure the mass flow rate of the hydrocarbons, the multiphase hydrocarbon mass meter measures the dielectric constant and the density of the mixture (column 5, lines 44-56). The multiphase hydrocarbon mass meter also calculates the dielectric constant and the density of the water (column 5, lines 44-56). Based on these factors, the multiphase hydrocarbon mass meter determines the mass of the hydrocarbons (column 5, lines 44-56). Using a flow meter to determine a volumetric flow rate of the mixture, the multiphase hydrocarbon mass meter determines a mass flow rate of the hydrocarbons (column 5, lines 44-56).

Suggitt and Gaisford do not teach or suggest all the claim limitations described in new claim 20. First, claim 20 describes a controller configured to "receive an estimated carbon content factor, said estimated carbon content factor being based on at least one potential constituent of said hydrocarbon feedstock, [and] to process said mass flow rate of said hydrocarbon feedstock and said estimated carbon content factor to determine an estimated carbon content of said hydrocarbon feedstock." Suggitt does not teach or suggest receiving an estimated carbon content factor or determining an estimated carbon content of a hydrocarbon feedstock. The evaluation system in Suggitt determines the heat content of a hydrocarbon stream, but not the carbon content. The multiphase hydrocarbon mass meter in Gaisford determines the hydrocarbon content and the water content of a mixture, but not the carbon content of the hydrocarbon stream.

Second, claim 20 describes a controller configured to "receive a carbon-to-steam ratio for said hydrogen production system, and to process said estimated carbon content of said hydrocarbon feedstock, said flow rate of said steam, and said carbon-to-steam ratio to control at least one of said flow rate of said steam and said flow rate of said hydrocarbon feedstock." Neither Suggitt nor Gaisford teaches or suggests a carbon-to-steam ratio. Suggitt teaches processing a heat content of a feed-gas, a desired heat content, a heat content of a recycle gas, a

flow rate of the recycle gas, and a flow rate of the feed-gas (column 9, line 61 to column 10, line 23). However, Suggitt never mentions a carbon content of the feed-gas, and consequently cannot teach a carbon-to-steam ratio. Gaisford teaches processing a dielectric constant and density of a multiphase mixture, a dielectric constant and density of water, and a volumetric flow rate of the multiphase mixture to determine a mass flow rate of the hydrocarbons (column 5, lines 44-56). However, Gaisford never mentions a carbon content of hydrocarbons, and consequently cannot teach a carbon-to-steam ratio. Neither Suggitt nor Gaisford teaches or suggests controlling a flow rate based on the carbon-to-steam ratio described in claim 20. Suggitt teaches controlling a flow rate of the feed-gas and the flow rate of the recycle gas. However, the control of these flow rates is based on a desired flow rate and a desired heat content for the partial oxidation unit, a flow rate and heat content of the feed-gas, and the flow rate and heat content of the recycle gas. The control of these flow rates is not based on the carbon-to-steam ratio described in claim 20. Gaisford does not teach controlling flow rates; Gaisford only measures flow rates.

Consequently, new claim 20 is new and non-obvious in view of Suggitt, Gaisford, or any combination thereof. The remarks in this section apply equally to new claim 30.

Japanese Abstract and Haldor Topsoe

The Japanese abstract teaches a method of producing hydrogen from an off-gas. The method measures the flow rate and the density of the off-gas. The method then estimates a carbon number/mol of the off-gas by looking at a measured density of the off-gas and using a correlation of density to carbon number/mol. The method then multiplies the flow rate of the off-gas and the carbon number/mol to get a total carbon number for the off-gas. The method then estimates a flow rate of the steam based on the total carbon number for the off-gas and a ratio of steam-to-carbon number, and controls the flow rate of the steam.

Haldor Topsoe teaches a method for controlling steam transferred to a steam reformer along with a feed stream (column 2, line 21 to column 4, line 21). The method determines a molar carbon flow of the feed stream based on a measured density of the feed stream (see Abstract). The method also determines a volumetric flow of the steam. The method compares the molar carbon flow and the steam flow in a molar steam carbon ratio to control the flow of the feed stream to the steam reformer.

The Japanese abstract and Haldor Topsoe do not teach or suggest all the claim limitations

described in new claim 20. Claim 20 describes "a controller configured to receive an estimated carbon content factor, said estimated carbon content factor being based on at least one potential constituent of said hydrocarbon feedstock, [and] to process said mass flow rate of said hydrocarbon feedstock and said estimated carbon content factor to determine an estimated carbon content of said hydrocarbon feedstock." The Japanese abstract and Haldor Topsoe do not teach this.

The Japanese abstract teaches looking at <u>a measured density</u> of the off-gas to estimate a carbon number/mol, and then multiplying the carbon number/mol times a flow rate (presumably a volumetric flow rate) to get a total carbon number. Haldor Topsoe teaches looking at <u>a measured density</u> of the feed stream to get a carbon number, and multiplying a volumetric flow rate times the carbon number to get the molar flow of carbon. On the other hand, the controller in claim 20 determines an estimated carbon content factor which is based on <u>one or more potential constituents</u> of the hydrocarbon feedstock, not a measured density of a hydrocarbon feedstock. Neither the Japanese abstract nor Haldor Topsoe teach considering the <u>potential constituents</u> of the feedstock and determining an estimated carbon content factor based on the <u>potential constituents</u>. Therefore, new claim 20 is new and non-obvious over the Japanese abstract, Haldor Topsoe, or any combination thereof. The remarks in this section apply equally to new claim 30.

The Applicants submit that there may be additional reasons in support of patentability, but that such reasons are moot in light of the above remarks and are omitted in the interests of brevity. The Applicants respectfully request allowance of claims 20-39.

Any fees in addition to those submitted may be charged to deposit account 03-1725.

Respectfully submitted,

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